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**PACKAGING PERFORMANCE TESTING OF A 55-GALLON DRUM CONTAINING FOUR 1-GALLON
AMBER GLASS (PHARMACEUTICAL) BOTTLES – PACKING GROUP I**

ALL TRANSPORTATION MODES

Date: April 27, 2004

**AFPTEF PROJECT NUMBER: 04-P-101
POP TEST ID NUMBER: DODPOPHM/USA/DOD/AF69/DLA-D029**

Part 1.

A. Title: PACKAGING PERFORMANCE TESTING OF A 55-GALLON DRUM CONTAINING FOUR 1-GALLON AMBER GLASS (PHARMACEUTICAL) BOTTLES – PACKING GROUP I

Report Number: DLA-D029

AFPTEF Project Number: 04-P-101

Manhours: 40

Report Type: FINAL

B.

TEST REPORT APPLICABILITY STATEMENTS see section 2E.

Report Prepared by:

SIGNED

SUSAN J. EVANS

Mechanical Engineer

Approved by:

SIGNED

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Chief, Transportation & Pkg Policy Branch

SIGNED

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Chief, AF Packaging Technology and Engineering

Testing Completion Date: 26 April 04

Approved for Publication and Dated: 27 April 04

Responsible Individual: Robbin L. Miller

Performing Activity: AF Packaging Technology and Engineering Facility

AFMC LSO/LOP

5215 Thurlow St

WPAFB OH 45433-5540

Specific Authority: Distribution Statement F. Further dissemination only as directed by AFMC LSO/LOP or higher DoD authority.

Requesting Organization: Defense Distribution Center

DDC-J-3/J-4-0

ATTN: POP Team

2001 Mission Drive

New Cumberland PA 17070

Part 2. Data Sheet

A. Exterior Shipping Container

UN Type: Drum, steel, removable head, 55 gallon

UN Code: 1A2

NSN: 8110-00-030-7780

Specification Number(s): N/A.

Container Manufacturer: Skolnik Industries, Chicago IL. [Myer Container Corp., supplier.]

Date of Manufacture: Unknown (GSA advice code "2G" – newest stock, from DOD Email)

Material: Steel

Container Dimensions: 22-7/16 in. x 33-5/16 in. ID;

Closure (Type/Method): Attached foam gasket on flat lid, locking ring, bolt, nut.

Closure Specification Number(s): N/A.

Reinforcement (Type/Method): N/A.

Reinforcement Specification Number(s): N/A.

Absorbent Material Description: Vermiculite, Fine Grain, Palmetto Vermiculite Company, Incorporated, Grade C-3; Hazmatpac A-900, HAZMATPAC Inc.; Absorbent GP, Absorption Corporation.

Additional Description: N/R

B. Inner Packaging of Combination Packaging

Type: Round amber glass bottle (Pharmaceutical bottle), with handle

NSN: N/A

Manufacturer/Distributor: Freund Container, Inc.

Date of Manufacture: N/R

Manufacturer's Number(s): 40128A

Capacity: 1 gallon (4 liter)

Dimensions: 6-1/8 in. x 13.5 in.; 1-1/8 in. opening I.D.

Closure (Method/Type): Screw cap (plastic), I.D. 1.5 in.; size 38/430, with polyethylene cone liner.

Secondary Closure (Method/Type): One strip of reinforced tape (as above) wrapped a minimum of 1 ½ times around and overlapping the cap base and the bottle neck.

Additional Description: Inner packaging of tested item (see photos, Figures 1 – 4, and drawing).

1. Line the drum with a 4-mil low density polyethylene bag, size 38 in. x 62 in., minimum thickness and dimensions (6-mil LDPE bags, 38 in. x 63 in. may also be used).

2. Place each bottle in a 3-mil LDPE, gusseted 10 in. x 8 in. x 24 in., polyethylene bag. Smooth bag up the sides of the bottle, twist shut (leaving some slack) and close tightly with strip of fiber-reinforced tape. Fold excess bag material down along bottle neck and place a second strip of tape around excess material and neck of bottle to hold material in place (Figure 1). **NOTE: Use of bags does not contribute to the ability of the bottles to avoid damage or leakage; non-use of bags in an otherwise exact same package should be considered an equivalent package.**

3. Place 10 inches of tightly compressed absorbent in bottom of drum. Place 4 bottles on the absorbent layer, centered and evenly spaced; each bottle center should be 6 inches from the drum side, and each bottle should be approximately 8 inches apart, measured from their centers (Figure 2). Fill all open space with absorbent until bottle tops are reached, tightly compressing the absorbent every 3 inches. Cover with approximately 10 inches of tightly packed absorbent. **NOTE: The quantity of absorbent used does meet the requirements of AFMAN 24-204(I), Atch 20. This packaging is intended for transportation by Military Aircraft.**

4. Shake or press down and firmly compress, and add absorbent if necessary to make a tight pack within the outer container.

5. Twist bag and tape closed with fiber reinforced tape (Figure 3).

6. Close drum using locking ring, bolt and nut to a maximum gap between the ring ends of 0.25 in., and tighten the bolt using the locking nut (Figure 4). **NOTE: Insert bolt through unthreaded lug first, thread the locking nut onto the bolt, then thread the bolt through the threaded lug. Locking nut must be on the bolt between the ring lugs, and tightened against the unthreaded lug to a minimum torque of 55 ft lb.**

C. Actual Product: Not Used**NSN:** NA**Specification:** Unknown**UN/DOT/IMO/IATA Proper Shipping Name:** Unknown**United Nations Code Number:** Unknown**United Nations Packing Group: I****UN Hazard Class:** Unknown **DOT Hazard Class:** Unknown**IMO Hazard Class:** Unknown **IATA Hazard Class:** Unknown**Physical State:** LIQUID**Amount per outer container:** Four 1-gallon bottles [8.2 kg (18 lb) each, calculated from specific gravity]**Density/Specific Gravity:** 1.8**Drop Height:** 1.8 meters (71 in.)**Minimum Stacking Weight/Force Required:** 322 kg (705 lb), based on Hazmatpac A900**Additional Description:** N/A**Vapor Pressure (liquids only) at 50°C:** Unknown**D. Test Product: Used****Name:** Propylene glycol/water with sand mixture**Physical State:** LIQUID**Amount per outer container:** Four 1-gallon bottles [8.2 kg (18 lb) each]**Gross Weight (packaged with vermiculite):** 103 kg (226 lb)**Gross Weight (packaged with Hazmatpac A900):** 132 kg (290 lb)**Gross Weight (packaged with Absorbent GP):** 93 kg (205 lb)**Density/Specific Gravity:** 1**Drop Height:** 1.8 meters (71 in.)**Minimum Stacking Weight/Force Required:** 322 kg (705 lb), based on Hazmatpac A900**Additional Description:** N/A**E. Test Applicability-** See test results in Part 6.

(1) Tests documented herein are design qualification. It is the responsibility of the government shipper/certifier to fully verify design compliance and packaging material quality.

(2) Drop testing performed herein was tested in accordance with DLAD 4145.41, AR 700-143, AFJI 24-210, NAVSUPINST 4030.55A, and MCO 4030.40A. This joint DoD policy document allows packaging to be drop tested more than once provided the packaging continues to pass the 49CFR 178.603 requirements. Questions about or clarification of this policy can be sought from the respective preparing activities of the regulation.

(3) DoD contractor use of this test report or its resultant certifying mark only with the permission of the testing activity AND as specified in DLAD 4145.41, AR 700-143, AFJI 24-210, NAVSUPINST 4030.55A, and MCO 4030.40A.

(4) Pass/fail conclusions were based on the particular specimens, both inner and outer containers, and quantities of each submitted for test. Extrapolation to other manufacturers, applications, commodities, inner containers, container sizes, or lesser internal quantities is the responsibility of the packaging design agency or applicable higher headquarters and the limitations documented in 49CFR. Extrapolation of test results based on lesser than minimum UN/DOT required test specimens is also the responsibility of the packaging design agency or applicable higher headquarters.

(5) Reference to specification materials has been made based on one of the following methods: supplied by AFPTEF, provided by the requester, markings printed on, attached to or embossed on the packaging.

(6) Testing performed in accordance with 49CFR 170-180, except as documented in this report.

(7) Performance testing was undertaken and completed at the request of an agency responsible for management of the dangerous good(s). The completion of successful UN/DOT testing does not, by itself, authorize the marking and transportation of the dangerous good(s). Applicable modal regulations should be consulted concerning the relationship of performance testing completed and the dangerous good(s).

(8) The DOT performance tests are intended to evaluate the performance of the entire packaging configuration's ability to prevent the release of contents during conditions normally incident to transportation. The criteria used to evaluate container system performance is whether the contents of the packaging are retained intact. The successful completion of the recommended tests does not ensure undamaged delivery.

(9) Tests performed and documented, herein, in no way verify Government supplier's operations (included but not limited to: internal procedures, suppliers, or manufacturing processes) comply with the DOT's or international's regulations. The testing facility has no knowledge and assumes no knowledge, that specific material testing requirements (i.e. plastics - only allowed to use regrind from the same operation; specific vendor plastic formulations including quantity of carbon black, ultra-violet inhibitors or pigments, or production run's individual leakproofness tests) are or were performed by the manufacturer(s) listed herein, unless otherwise noted in the report.

Part 3. Introduction.

Brief description of why specific tests were performed and rationale for the test product selected (if applicable).

Packing Group I testing was requested on the above stated configuration. For lesser volumes, variations to testing requirements can be found in 49 CFR, part 178.601(g). The tested configuration is intended for all transportation modes.

Each packaging was subjected to appropriate drop and vibration testing as prescribed by ASTM D4919. These tests are designed to simulate the shock and vibration a package configuration may encounter during conditions normally incident to transportation. The order of testing was drop test followed by the vibration test; the stacking and hydrostatic pressure (to 250 kPa) tests were performed on outer containers not otherwise used in testing. Manufacturer leak and hydrostatic (to 100 kPa) results were accepted (Myers Container Corp. test date 2 March 04).

This configuration was tested using vermiculite, Absorbent GP and Hazmatpac A900. The configuration met test requirements with all three, therefore all three absorbents may be used provided the maximum gross weight for each (above) is not exceeded and they are not incompatible with the substance(s) in the inner packagings.

The use of one sample packaging configuration for multiple tests and drops is DoD policy as stated in DLAD 4145.41, AR 700-143, AFJI 24-210, NAVSUPINST 4030.55A, and MCO 4030.40A. This option was exercised in this test as noted in Part 6.

Part 4. Tests Required/Performed (as applicable).

NOTE: Packagings fabricated from fiberboard, paperboard, or paper, including composite containers with outer fiberboard containers, should be conditioned for a minimum 24 hours prior to any testing. Standard conditions $23 \pm 3^{\circ}\text{C}$ ($73 \pm 4^{\circ}\text{F}$) and $50 \pm 2\%$ relative humidity apply.

A. Leakproofness test. 3 outer containers each individually tested for 5 minutes (30 minutes for plastic containers). Previously performed by manufacturer.

B. Hydrostatic Pressure Test. 3 outer containers each individually tested for 5 minutes at 250 kPa (36 psi). Previously tested by the manufacturer to 100 kPa (15 psi).

C. Stacking Test. One test per outer container, 3 containers required. Compression by a top load is calculated to simulate a stack height of 3 meters, maintained for 24 hours. **NOTE:** If only one configuration sample is tested, test duration shall be 72 hours.

Static weight. Apply the calculated weights using a constant load evenly over the entire container.

$$M = \frac{m (3000-h)}{h}$$

where: m = container's gross mass (as shipped) in kilograms = outer container + absorbent fill + [number of inner containers * specific gravity of lading * volume of inner container * 3.8 (mass of water in kg) * 0.98 (min. filling of inner container)] = **132 kg**

h = container's height in millimeters = **873.125 mm** (effective height for container in stack)

M = constant minimum load mass in kilograms = **322 kg**

or:
$$W = \frac{w (118-h)}{h}$$

where: w = container's gross mass (as shipped) in pounds = outer container + absorbent fill + [number of inner containers * specific gravity of lading * volume of inner container * 8.3 (mass of water in lb) * 0.98 (min. filling of inner container)] = **290 lb** (highest sample weight)

h = container's height in inches = **34.375 in.** (effective height for container in stack)

W = constant minimum load weight in pounds = **705 lb**

NOTE: Where the contents of the test sample are non-dangerous liquids with relative density different from that of the liquid to be transported, the force shall be calculated in relation to the latter.

Information - This test assumes similar weight containers stacked on top of the test sample. This may or may not be a valid assumption. This calculation also only provides a minimum weight. Consideration should be given to what will actually be experienced in the transportation cycle.

D. Drop Test. 6 drops in order: 3 drops diagonally on the chime, 3 drops on the weakest part not tested by the first drop (closure and/or welded longitudinal seam of the drum body). The drop height shall be appropriate for the packaging group of the commodity. The container shall strike a target which shall be a rigid, non-resilient, flat, and horizontal surface. The center of gravity shall be vertically over the point of impact. **NOTE:** All drops may be made on only one sample. If the sample fails after drops 2 through 6, it may be replaced by another sample identically loaded. This option was used as noted in Part 3.

1. Solids and liquids, if the test is performed with the actual contents to be carried, or with another substance having essentially the same characteristics, or for liquids if the test is performed with water and the intended contents has density less than 1.2 g/cm³ (specific gravity less than 1.2) the drop height shall be:

<u>Packing Group</u>	<u>Drop Height</u>
I	1.8m (70.9 in.)
II	1.2m (47.2 in.)
III	0.8m (31.5 in.)

2. Where the test sample doesn't contain the intended contents and its specific gravity is greater than 1.2, then obtain the required drop height in meters by calculating the following with product density (d):

<u>Packing Group</u>	<u>Drop Height</u>
I	(d) x 1.5m ((d) x 59.1 in.)
II	(d) x 1.0m ((d) x 39.4 in.)
III	(d) x 0.67m ((d) x 26.4 in.)

Round the drop height up to the first decimal.

E. Vibration Test (domestic requirement). One test per container, total of three test specimens.

The test shall be performed for 1 hour at a frequency that causes the package to be raised from the vibrating platform to such a degree that a piece of material approximately **0.2 cm** (1/16 in.) thickness can be passed between the bottom of the package and the platform. The vibrating platform shall have a vertical double-amplitude (peak-to-

peak) displacement of **2.54 cm** (1 in.). Perform tests in accordance to 49CFR 173 Subpart B, Appendix C and 49 CFR 178. **NOTE:** If only one configuration sample is tested, test duration shall be 3 hours.

F. Fiberboard Water Resistance (Cobb) Test. N/A

Part 5. Criteria for Passing Tests.

A. Leakproofness Test. There must be no leakage of air from the packaging.

B. Hydrostatic Pressure Test. Any leakage is cause for rejection.

C. Stacking Test.

No test sample shall leak. Composite and combination containers shall not exhibit leakage of the filling substance from the inner receptacle or container. No test sample shall show deterioration which adversely affects transportation safety or show any distortion liable to reduce its strength, cause stacking instability, or cause damage to internal container components likely to reduce transportation safety.

D. Drop Test.

Each packaging containing liquids shall be leakproof when internal and external pressures are equalized. Composite and combination containers shall not exhibit damage to the outer packaging likely to adversely affect transportation. In addition, the inner packaging shall not leak into the filling substance or lading.

E. Vibration Test.

No rupture or leakage from any of the packages. No test specimen shall show any deterioration which could adversely affect transportation safety, result in possible discharge of contents or reduce packaging strength.

F. Fiberboard Water Resistance Test. N/A

Part 6. Discussion and Test results.

Narrative description of test results, including any rationale for variations. For each packaging to pass, all applicable tests must be performed and pass criteria listed herein.

A. Leakproofness Test. Manufacturer test results accepted. See attached Myers Container Corp. UN Test Summary.

B. Hydrostatic Pressure Test.

Manufacturer test results for 100 kPa accepted. A hydrostatic test at 250 kPa was attempted, however the drum began to leak at 124 kPa and the test was discontinued. See Figure 5 and attached Myers Container Corp. UN Test Summary.

C. Drop Test. Pass

Tested at ambient conditions. Each packaging was dropped 1.8 meters to strike the chime diagonally 3 times; it was then dropped diagonally onto the closing ring two times with each impact at a different point near the closing bolt and dropped one time on its side to impact the welded seam. There was no damage after any one drop to the inner or outer packagings that would be likely to cause leakage from, or weakening of, the packagings during transportation. See Figure 6.

D. Stacking Test. Pass

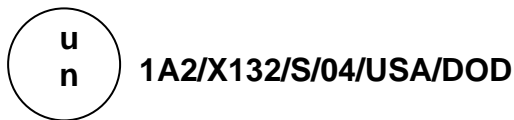
Duration: 72 hours at standard conditions: 23°C, 50% RH. One empty closed outer container was stacked with 1250 lb for 72 hours. There was no damage to the drum nor stack instability. No adverse results were noted. See Figure 7.

E. Vibration Test. Pass

Duration: 3 hours at ambient. The same packagings used in the drop tests were also used for the vibration test. Each packaging was tested on an electro-hydraulic vibration table which was set at 1-inch vertical double amplitude (peak-to-peak) displacement, at a frequency such that the packaging was raised from the platform. The distance was measured using a 1/16-inch feeler gage. At approximately 4.06 Hz the feeler gage could be passed between the bottom of the package and the table surface. There was no additional damage to the outer container caused by the vibration and no leakage from the inner containers. This test procedure duration of 3 hours with one container exceeds the 49 CFR requirements. See Figure 8.

F. Water Resistance (Cobb) Test. N/A**Part 7. Performance Marking on Container:**

The container specified herein passes the DoT and international regulatory requirements to the extent tested. Equivalent DoD built or grandfathered containers MAY also qualify for the following marking as directed by DoD policy documents.

**Part 8. References**

- A. 49CFR 170-180
- B. DLAD 4145.41/AR 700-143/AFJI 24-210/NAVSUPINST 4030.55A/MCO 4030.40A - Packaging of Hazardous Materials
- C. ISO 535/TAPPI T 441/ASTM 3285 - Determination of Water Absorption of Paper and Board (Cobb Method)
- D. ISO 3574 - Cold-reduced carbon steel sheet of commercial and drawing quantities.
- E. ASTM D999 - Methods for Vibration Testing of Shipping Containers.

Part 9. Distribution List

Commander
 Defense Logistics Agency
 DDC-J-3/J-4-0
 ATTN: POP Team
 2001 Mission Drive
 New Cumberland PA 17070

AFMC LSO/LOP
 Project Folder



Figure 1. 1-gallon glass jug in plastic bag.



Figure 2. Placement of four 1-gallon glass jugs in outer container. (bottles shown unbagged for illustration clarity)



Figure 3. Closure of inner liner.



Figure 4. Closure of outer container.



Figure 5. Hydrostatic pressure test..



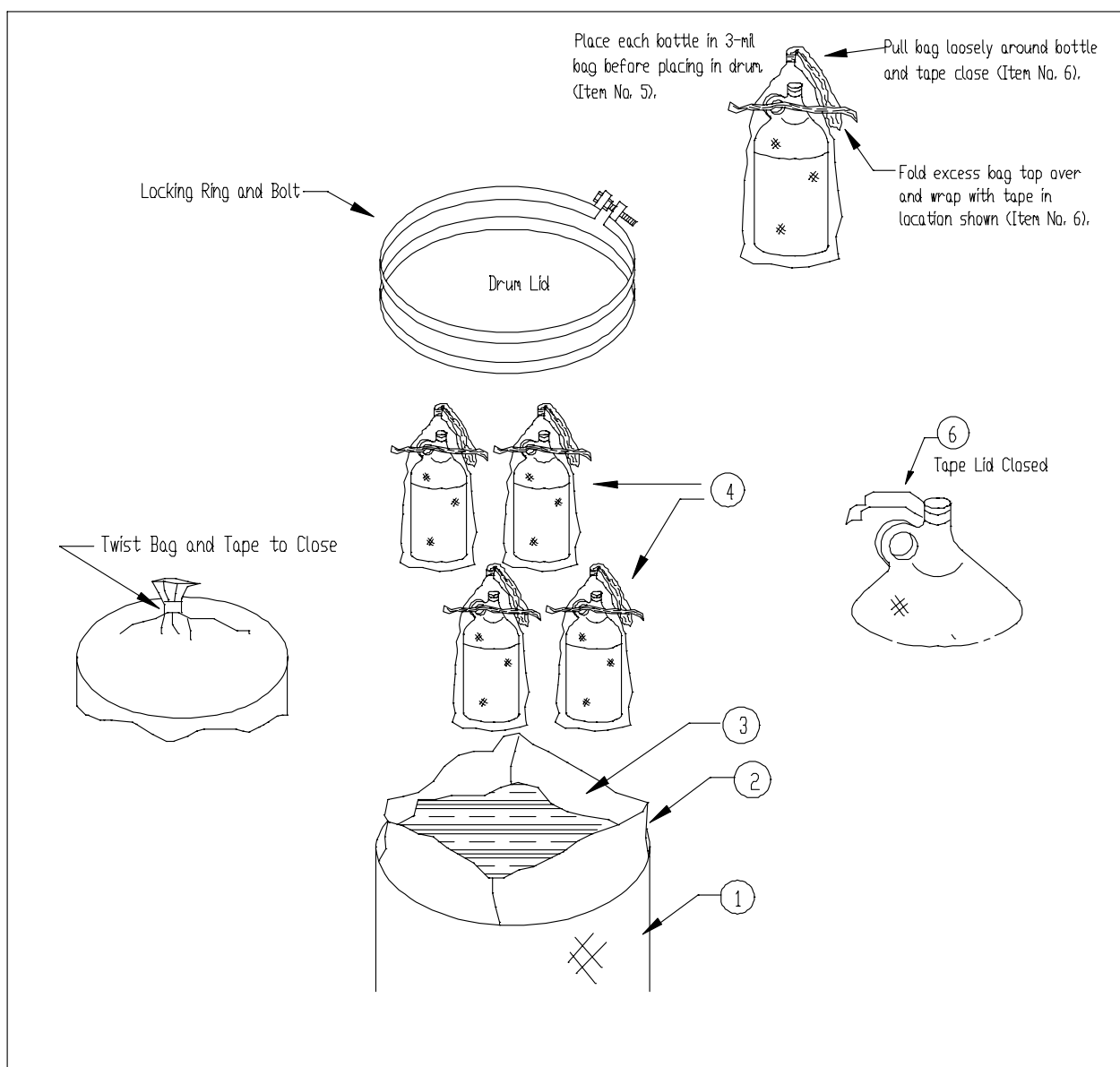
Figure 6. Drop test.



Figure 7. Stack test performed on empty outer container.



Figure 8. Vibration test.



6	A/R	Fiber Reinforced Tape	NSN 7510-00-582-4772
5	A/R	3-mil Poly Bag (if used)	Freund Part No. GH10824, 10 in x 8 in. x 24 in.
4	4	Inner Containers, 4 L (1 gal) Amber Glass Pharm.	Freund Stock No. 40128A
3	A/R	Absorbent Fill	Vermiculite, Absorbent GP, Hazmatpac A900
2	1	4 or 6 mil LDPE Bag	Min. Dim. 38 in. x 63 in.
1	1	Steel Removable Head Drum	NSN 8110-00-030-7780
Item	Qty	Description	Notes
		AFPTF Air Force Packaging Technology and Engineering Facility	Note: Follow All Instructions in TR
File: DLAFO29-04.DWG			Dimensions in Inches
Dwg No: DLAFO2904D			Scale: NONE
Engineer: SJ Evans			PAGE 1 OF 1
		DATE: 9 April 04	

Myers Container CorporationUN Testing Laboratory
900 Brookside Drive
San Pablo, CA 94806**UN Test Summary**

Non-Bulk Steel Packagings

As required by
49 CFR 178**5A58**

3/2/04

Design Qualification

1032

Test Date

UNUM#

Design Number

<p>Style 1A2</p> <p>Condition NEW</p> <p>Capacity 208.2 liters 55.0 gal</p> <p>Overflow 213.5 liters 56.4 gal</p> <p>Tare 18.6 kg 41 lbs</p> <p>Height 850.9 mm 33.5 in</p> <p>Diameter 571.5 mm 22.5 in</p> <p>Steel-Head 1.2 mm</p> <p>Steel-Body 0.9 mm</p> <p>Steel-Bottom 1.2 mm</p> <p>Special Construction Cargile curl, DOT 7-A compliant with 4-10 mil bag, UNUM 390 (History in 5558)</p>	<p>End Seam TRIPLE</p> <p>Side Seam WELDED</p> <p>Swedges 3</p> <p>Head Fittings 2" X 3/4"</p> <p>Body Fittings</p> <p>Fitting Gasket Poly</p> <p>Covers 2 Re-enforce Ring</p> <p>Gasket EPDM</p> <p>Gasket Diameter 7/16"</p> <p>Ring Gage 12 GA</p> <p>Closure Ring V-BACK</p> <p>Bolt Size 5/8"</p>	<p style="text-align: right;">55-OH</p> <p style="text-align: right;">33.5</p> <p style="text-align: right;">850.9</p> <p style="text-align: right;">MM</p> <p style="text-align: right;">22.5"</p> <p style="text-align: right;">571.5</p> <p style="text-align: right;">MM</p> <p style="text-align: right;">*Dimension tolerance NOMINAL</p>																																																																																																																								
<p>Drop Test - Liquid (§178.603)</p> <p>Six samples are filled to >= 98% capacity with water. Each sample is dropped from the indicated height onto a solid surface using various attitudes. Drums are vented after each drop. Weakest Part: Tight-heads, second drop is flat on side seam. Open-heads second drop diagonal on head.</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Sample</th> <th>Attitude</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td rowspan="6" style="text-align: center; vertical-align: middle;">1.5</td> <td>1 Chime Diagonal</td> <td>No Leak</td> </tr> <tr> <td>2 Chime Diagonal</td> <td>No Leak</td> </tr> <tr> <td>3 Chime Diagonal</td> <td>No Leak</td> </tr> <tr> <td>4 Weakest Part *</td> <td>No Leak</td> </tr> <tr> <td>5 Weakest Part *</td> <td>No Leak</td> </tr> <tr> <td>6 Weakest Part *</td> <td>No Leak</td> </tr> </tbody> </table> <p style="text-align: center;">Meters</p> <p>Leakproofness Test - Liquid (§178.604)</p> <p>Three samples, with all closures in place, are subjected to the following internal pressure and restrained under water for a minimum of five minutes.</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Sample</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td rowspan="3" style="text-align: center; vertical-align: middle;">20 kPa</td> <td>1 No Leak</td> </tr> <tr> <td>2 No Leak</td> </tr> <tr> <td>3 No Leak</td> </tr> </tbody> </table> <p>Hydrostatic Pressure Test - Liquid (§178.605)</p> <p>Three samples are filled to >= 98% capacity with water and subjected to the following internal hydraulic pressure for five minutes.</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Sample</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td rowspan="3" style="text-align: center; vertical-align: middle;">100 kPa</td> <td>1 No Leak</td> </tr> <tr> <td>2 No Leak</td> </tr> <tr> <td>3 No Leak</td> </tr> </tbody> </table> <p>Stacking Test - Liquid (§178.606)</p> <p>Three samples are filled to >= 98% capacity with water and subjected to a force applied to the top surface of the drum for 24 hours equal to the total weight of identical packages which might be stacked on it during transport. Minimum stack height is 3 m.</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Sample</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td rowspan="3" style="text-align: center; vertical-align: middle;">1297.3 Kilograms</td> <td>1 No Deformation</td> </tr> <tr> <td>2 No Deformation</td> </tr> <tr> <td>3 No Deformation</td> </tr> </tbody> </table>	Sample	Attitude	Result	1.5	1 Chime Diagonal	No Leak	2 Chime Diagonal	No Leak	3 Chime Diagonal	No Leak	4 Weakest Part *	No Leak	5 Weakest Part *	No Leak	6 Weakest Part *	No Leak	Sample	Result	20 kPa	1 No Leak	2 No Leak	3 No Leak	Sample	Result	100 kPa	1 No Leak	2 No Leak	3 No Leak	Sample	Result	1297.3 Kilograms	1 No Deformation	2 No Deformation	3 No Deformation	<p>Drop Test - Solid (§178.603)</p> <p>Six samples are filled to 95% capacity with a small grain lading. Each sample is dropped from the indicated height onto a solid surface using various attitudes.</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th colspan="3">Packing Group I 1.8 Meters</th> <th colspan="3">Packing Group II 1.2 Meters</th> <th colspan="3">Packing Group III .8 Meters</th> </tr> </thead> <tbody> <tr> <td colspan="3" style="text-align: center;">415</td> <td colspan="3"></td> <td colspan="3"></td> </tr> </tbody> </table> <p>Gross Mass - Kilograms Indicated Above</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Sample</th> <th>Attitude</th> <th>Result</th> <th>Sample</th> <th>Attitude</th> <th>Result</th> <th>Sample</th> <th>Attitude</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Chime Diagonal</td> <td>No Leak</td> <td>1</td> <td>Chime Diagonal</td> <td>No Leak</td> <td>1</td> <td>Chime Diagonal</td> <td>No Leak</td> </tr> <tr> <td>2</td> <td>Chime Diagonal</td> <td>No Leak</td> <td>2</td> <td>Chime Diagonal</td> <td>No Leak</td> <td>2</td> <td>Chime Diagonal</td> <td>No Leak</td> </tr> <tr> <td>3</td> <td>Chime Diagonal</td> <td>No Leak</td> <td>3</td> <td>Chime Diagonal</td> <td>No Leak</td> <td>3</td> <td>Chime Diagonal</td> <td>No Leak</td> </tr> <tr> <td>4</td> <td>Closure Diagonal</td> <td>No Leak</td> <td>4</td> <td>Closure Diagonal</td> <td>No Leak</td> <td>4</td> <td>Closure Diagonal</td> <td>No Leak</td> </tr> <tr> <td>5</td> <td>Closure Diagonal</td> <td>No Leak</td> <td>5</td> <td>Closure Diagonal</td> <td>No Leak</td> <td>5</td> <td>Closure Diagonal</td> <td>No Leak</td> </tr> <tr> <td>6</td> <td>Closure Diagonal</td> <td>No Leak</td> <td>6</td> <td>Closure Diagonal</td> <td>No Leak</td> <td>6</td> <td>Closure Diagonal</td> <td>No Leak</td> </tr> </tbody> </table> <p>Net Mass - Kilograms = Gross Mass less Tare Weight</p> <p>Stacking Test - Solid (§178.606)</p> <p>Three samples are filled to 95% capacity with a small grain lading and subjected to a force applied to the top surface of the drum for 24 hours equal to the total weight of identical packages which might be stacked on it during transport. Minimum stack height is 3 m.</p> <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Sample</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td rowspan="3" style="text-align: center; vertical-align: middle;">1297.3 Kilograms</td> <td>1 No Deformation</td> </tr> <tr> <td>2 No Deformation</td> </tr> <tr> <td>3 No Deformation</td> </tr> </tbody> </table>	Packing Group I 1.8 Meters			Packing Group II 1.2 Meters			Packing Group III .8 Meters			415									Sample	Attitude	Result	Sample	Attitude	Result	Sample	Attitude	Result	1	Chime Diagonal	No Leak	1	Chime Diagonal	No Leak	1	Chime Diagonal	No Leak	2	Chime Diagonal	No Leak	2	Chime Diagonal	No Leak	2	Chime Diagonal	No Leak	3	Chime Diagonal	No Leak	3	Chime Diagonal	No Leak	3	Chime Diagonal	No Leak	4	Closure Diagonal	No Leak	4	Closure Diagonal	No Leak	4	Closure Diagonal	No Leak	5	Closure Diagonal	No Leak	5	Closure Diagonal	No Leak	5	Closure Diagonal	No Leak	6	Closure Diagonal	No Leak	6	Closure Diagonal	No Leak	6	Closure Diagonal	No Leak	Sample	Result	1297.3 Kilograms	1 No Deformation	2 No Deformation	3 No Deformation
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